ADHD

Child, parent or teacher concerns for hyperactivity or inattention

Assessment including review of ADHD symptoms, standardized measure (e.g. Vanderbilt) of symptoms per teacher and parent report consideration of differential diagnoses, family and social history

Consider a diagnosis of ADHD with the following symptoms:
Can't sit still/hyperactive
Lack of attention/poor concentration/doesn't seem to listen/daydream
Impulsive/acts without thinking
Behavior problems
Poor academic performance/underachievement

Are the DSM-IV criteria met for ADHD?

Yes → Diagnosis of ADHD

No → Is there evidence of developmental concern or alternative diagnoses?

Differential Diagnosis includes:
Learning/language disorders
Oppositional defiant disorder
Conduct D/o
Anxiety
Depression
Substance abuse

Yes → Address co-morbid conditions

No → Reassess concerns

Diagnosis of ADHD → First line stimulant: select either extended release methylphenidate (mph) or amphetamine formulation (amph) (see chart below). Titrate to effect or limiting adverse effects.

ADHD symptoms fully treated by clinical report and standardized measures?

Yes → Continue stimulant treatment, monitoring q1-2 months with standardized parent and teacher report

No → Trial of other stimulant class (mph or amph)

ADHD symptoms fully treated by clinical report and standardized measures?

Yes → Continue stimulant treatment, monitoring q1-2 months with standardized parent and teacher report

Reassess diagnosis, consider atomoxetine, buproprion, or specialty referral → Refer to specialty mental health professional

References :
Reference: Contemporary Pediatrics (2003) Focus on ADHD: Diagnosis, Treatment, Comorbidity; Pp.51-73.
Pliszka, S.R., et al., *The Texas Children's Medication Algorithm Project: Revision of the Algorithm for Pharmacotherapy of Attention-Deficit/Hyperactivity Disorder.* JAACAP, 2006. **45**(6): p. 642-657.

1AACAP, *Practice Parameter for the Use of Stimulant Medications in the Treatment of Children, Adolescents, and Adults.* Journal of the American Academy of Child & Adolescent Psychiatry, 2002. **41**(2S): p. 26S-49s.

ADHD Resource Guide

What are the symptoms of ADHD?

ADHD symptoms usually arise in early childhood. Current diagnostic criteria indicate that the disorder is marked by behaviors that are long lasting and evident for at least six months, with onset before age seven. There are three primary subtypes, each associated with different symptoms.

ADHD - Primarily Inattentive Type:

• Fails to give close attention to details or makes careless mistakes.
• Does not appear to listen.
• Struggles to follow through on instructions.
• Has difficulty with organization.
• Avoids or dislikes tasks requiring sustained mental effort.
• Is easily distracted.
• Is forgetful in daily activities.

ADHD - Primarily Hyperactive/Impulsive Type:

• Fidgets with hands or feet or squirms in chair.
• Has difficulty remaining seated.
• Runs around or climbs excessively.
• Has difficulty engaging in activities quietly.
• Acts as if driven by a motor.
• Talks excessively.
• Blurts out answers before questions have been completed.
• Has difficulty waiting or taking turns.
• Interrupts or intrudes upon others.

ADHD - Combined Type:

• Meets both inattentive and hyperactive/impulsive criteria.

All types

- More frequent or severe than in other children of the same age.
- Create significant difficulty in at least two areas of life, such as home, social settings, school, or work.

Pathophysiology

Findings from neuropsychological studies suggest that the frontal cortex and the circuits linking them to the basal ganglia are critical for executive function and, therefore, to attention and exercising inhibition. Many findings support this view, including those described below.

Executive functions are major tasks of the frontal lobes. Functional MRI of the right mesial prefrontal cortex in persons with ADHD reveals decreased activation (low arousal) during tasks that require motor inhibition. . MRI in people with ADHD also suggests low activity in the right inferior prefrontal cortex and left caudate during a task that involves timing of a motor response. .

Catecholamine controlled dopaminergic and noradrenergic neurotransmission appear to be the main targets for medications used to treat ADHD.

Causes

Genetic factors appear to be play an important role in ADHD. However, many environmental factors have been correlated with ADHD and may increase or decrease risk of ADHD morbidity in predisposed patients.

Epidemiology

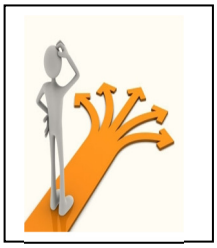
Prevalence: 3-7%.

Comorbidity: 50-60% meet *DSM-IV* criteria for at least one of the possible coexisting conditions

- learning disorders
- depression
- anxiety disorder
- oppositional defiant disorder
- substance abuse disorder,
- Conduct disorder.

Gender: Boys:Girls ratio 2-4:1

Course over time: 30-80% of children with ADHD have the disorder as adults. Most experts believe that the rate is well above 50%, with more prominent inattentive symptoms than hyperactive symptoms.



Differential Diagnosis

DSM-IV-TR Diff Dx Differential Diagnosis by the Tables 2011 American Psychiatric Publishing, Inc.	
Attention-Deficit/Hyperactivity Disorder must be differentiated from . . .	**In contrast to Attention-Deficit/Hyperactivity Disorder, the other condition . . .**
Age-appropriate behaviors in active children	Does not cause clinically significant impairment.
Under-stimulating environments	Leads to inattention that is related to boredom.
Inattention in Oppositional Defiant Disorder	Results from unwillingness to conform to others' demands.
Impulsivity in Conduct Disorder	Is associated with a pattern of antisocial behavior.
Inattention or hyperactivity associated with Pervasive Developmental Disorders	Has a characteristic symptom presentation with marked defects in social relatedness, serious delays in language, and a restricted range of interests and behaviors.
Inattention or hyperactivity caused by drugs of abuse or medications (e.g., bronchodilator)	Remits when drug of abuse or medication is discontinued and is diagnosed as Substance-Related Disorder Not Otherwise Specified or Adverse Effects of Medication Not Otherwise Specified.
Symptoms of inattention due to other mental disorders (e.g., Mood or Anxiety Disorders)	• Has the characteristic features of the other mental disorder, and onset is typically after age 7 years. • Attention-Deficit/Hyperactivity Disorder is not diagnosed if inattention occurs exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder, or if it is better accounted for by another mental disorder.
Medical conditions that can mimic ADHD	• Fetal Alcohol Syndrome • Fragile X Syndrome • Hearing Impairment • Medication side effects • Obstructive sleep apnea • Other chronic disease • Substances of abuse • Thyroid disease • Toxins • Vision impairment • Cerebral palsy • Communication disorders • Developmental delays • Learning disabilities • Mental retardation • Neurodevelopmental syndromes • Seizure disorder
Adjustment to stressors	• Abuse • Family stressor/change/dysfunction • Neglect • Parenting dysfunction • Stress in environment (new home, new school)

ADHD Assessment Strategies

Universal screening- Pediatric Symptom Checklist or other broad-band screener. Attend to "2"'s on items related to inattention and/or impulsivity.

Symptom-Specific Structured measures

- Vanderbilt ADHD Rating Scale (ages 6-12)
    - Inattentive type likely if 6 or more "2's" or "3's" on items 1-9
    - Hyperactive type likely if 6 of more "2's" or "3's" on items 10-18
    - Combined type likely if meets both inattentive and hyperactive

ADHD evaluation: The relevant history

Parental concerns
Child's strengths and weaknesses
Duration and onset of symptoms
Goals for evaluation process
Level of impairment
Past approaches to concerns
Specific problems perceived by caregivers

Behavioral history
Ability to separate from caregivers
ADHD symptoms
Psychiatric symptoms
Psychological counseling
Sleep issues (poor quality or quantity, nightmares, snoring)
Suicidal and/or homicidal attempts or thoughts
Temperament (colic, temper tantrums, irregular or picky eating, difficulty keeping a babysitter)

Medical history
Birth history (prematurity, prenatal substance abuse, complications during the pregnancy, labor, or delivery)
Depression
Growth problems
Learning problems
Loss of consciousness/Traumatic Brain Injury
Medications (to include vitamins, herbal supplements, and OTC remedies)
Meningitis or encephalitis
Recurrent headache or abdominal pain
Seasonal allergies
Seizures
Staring spells
Tics

Developmental history
Milestones
Speech, physical, or occupational therapy

Educational history
Conflict with school staff or with classmates
Current academic performance
Disciplinary actions at school (suspensions), consistency of education
Discussions about repeated grades or classes
Earl intervention programs
Individualized educational program
Problems in completed grades
Special education
Strongest and weakest academic areas

Family history
ADHD
Mental illness
Drug and alcohol abuse
Neurologic disorders
Learning or reading difficulties
Birth defects
Legal problems
Physical or sexual abuse
Thyroid disease
Toxic exposures

Personal and social history
Family dysfunction
Living arrangements
Problems with authorities
Social skills
Substance abuse
Work performance

Physical

- Likely normal physical examination although may see symptoms of hyperactivity
- The following should be included at onset of medication use and periodically to assess for medication-related negative effects:
    - Vital signs
        - Height
        - Weight
        - Blood pressure
        - Pulse
    - General appearance
        - Fidgeting
        - Impulse control
        - State of arousal
    - Mental status examination
        - Affect (facial expression)
        - Cognition
        - Thought patterns/organization

Primary Care Management of ADHD

Primary care providers provide most of the ADHD assessment and management in the country. Each provider will have a different level of comfort and experience in treating ADHD beyond the second line treatment.

Principles for pharmacotherapy for ADHD

- First line treatment should be with either a methylphenidate or mixed amphetamine salt formulation. Choice depends on family preference, family history of response to treatment, and provider comfort. Need for non-pill form of the medication should also be considered .
- Mixed amphetamine salts are twice as potent as methylphenidate formulations (5 mg mixed amphetamine salts= 10 mg methylphenidate)
- For school age children, there is no advantage to starting with short acting medicaitons. Extended release will reduce logistical challenges and stigma in school.
- Dose should be increased weekly until optimal effect is reached or side effects are encountered.
- Structured measures for parent and teacher report should be used at each visit until dose established and then regularly after that time.
- Second line treatment should be the alternative stimulant class with same titration approach.
- Beyond second line treatment, reassess diagnosis and non-pharmacolgoical treatment. May consider alpha agonists (especially if significant impulsive symptoms), atomoxetine (especially if co-morbid anxiety or predominantly inattentive symptoms) or buproprion (especially if depression).
- If good effect but decrease appetite
  - Consider weekend medication “holidays”
  - Increased late afternoon/evening caloric intake
  - Avoid appetite stimulants unless multiple other approaches (including medication change) have failed
- If good effect but sleep disturbances
  - Assess and address sleep hygiene
  - Consider shorter acting formulation
  - If already tried other medications, consider alpha agonist at night for sleep
- Concurrent medications
  - Some evidence exists to support use of stimulant + alpha agonists for difficult to treat ADHD
- Does the patient need behavioral therapy?
  - In the Multimodal treatment of ADHD Study (MTA), children with co-morbid anxiety conditions and those from low income families benefitted from the combination of behavioral treatment PLUS stimulants.
- How frequently should they be seen?
  - At least monthly until dose stabilized
  - MTA study showed that children seen at least 9 times per year had substantially better control of ADHD than those seen 6 times per year!
  -

Indicators of need for specialty referral

The timing of consultations depends on the practitioner's degree of knowledge and experience with the evaluation and treatment of ADHD.

Consider brief consultation if

- Refer if the medication is causing side effects or is no longer effective, if there are co-morbidities, or if the medication cannot be adjusted with confidence.

Consider referral for evaluation if:

- Unanswered questions about ADHD or coexistent conditions.
- Concerning family history of a mood or anxiety disorder thought to complicate the differential diagnosis or potential response to treatment
- Substance abuse in patient with ADHD

The 2 major components in the medical care of children with attention deficit hyperactivity disorder (ADHD), previously termed attention deficit disorder (ADD), are behavioral and pharmaceutical therapies.

ADHD MEDICATIONS

Medication	Brand Name	Initial Pediatric Dose	Pediatric Dosage Range and Maximum Dose*	Common Pediatric Dose*	Usual duration of effect	Preparations
Methylphenidate immediate release	Ritalin Methylin methylphenidate	2.5-5 mg TID	0.1-0.8 mg/kg/dose PO qd to 5 times/d; not to exceed 60 mg/d	0.3-0.5 mg/kg/dose PO tid/qid	4	All preparations available as 5-mg, 10-mg, or 20-mg scored tabs; Methylin also available as 2.5-mg, 5-mg, or 10-mg chewable tab and PO solution (5 mg/5 mL and 10 mg/mL)
Methylphenidate sustained-release (SR)	Ritalin LA Metadate CD	10 mg	0.2-1.4 mg/kg/dose PO qd/tid; not to exceed 60 mg/d	0.6-1 mg/kg/dose PO qd/bid	6-8 hours	10-mg, 20-mg, 30-mg, or 40-mg tabs (Metadate also has 50-mg and 60-mg tabs.); can be sprinkled into soft food (Do not cut, crush, or chew.)
Methylphenidate extended release (ER)‡	(Ritalin SR Methylin ER Metadate ER generic S	10	0.2-1.4 mg/kg/dose PO qd/tid; not to exceed 60 mg/d	0.6-1 mg/kg/dose PO qd/bid	7-8 hours	Ritalin SR: 20-mg Spansules (Do not cut, crush, or chew.) Metadate ER: 10, 20 mg (not readily available)
Methylphenidate OROS tablets	Concerta	18 mg	0.3-2 mg/kg PO qd; not to exceed 54 mg/d	0.8-1.6 mg/kg PO qd	8-12 hours	18-mg, 27-mg, 36-mg, and 54-mg tabs (Do not cut, crush, or chew.
Methylphenidate transdermal patch†	Daytrana	Convert from IR or use 10 mg qd	0.3-2 mg/kg released over 9 h; not to exceed one 30-mg patch	10-30 mg released over 9 h	Duration may be titrated. Apply 2 hours before desired effect. Effect lasts ~ 5 hours after removal of patch.	10-mg, 15-mg, 20-mg, 30-mg patches, applied to the hip.
Medication	**Brand name**	**Initial Pediatric**	**Pediatric Dosage Range**	**Common Pediatric Dose**	**Duration of effect**	**Preparations**

		Dose	**and Max dose**			
Dexmethylphenidate IR	Focalin	2.5-5-mg	0.1-0.5 mg/kg/dose PO qd to qid; not to exceed 20 mg/d	0.2-0.3 mg/kg/dose PO bid/tid	4	2.5-mg, 5-mg, or 10-mg scored tabs (Do not cut, crush, or chew.)
Dexmethylphenidate extended release	Focalin XR	5-10-mg	0.2-1 mg/kg/dose PO qd to bid; not to exceed 20 mg/d	0.4-0.6 mg/kg/dose PO qd/bid	Up to 12 hours	5-mg, 10-mg, or 20-mg scored tabs; can be sprinkled into soft food (Do not cut, crush, or chew.)
Dextroamphetamine	Dexedrin Dextrostat	2.5-5 mg	0.1-0.7 mg/kg/dose PO qd/qid; not to exceed 60 mg/d	0.3-0.5 mg/kg/dose PO qd/tid	4	Dexedrine: 5-mg scored tabs; Dextrostat: 5-mg and 10-mg scored tabs
Dextroamphetamine Spansules	Dexedrine CR	5 mg	0.1-0.75 mg/kg/dose PO qd/bid; not to exceed 60 mg/d	0.3-0.6 mg/kg/dose PO qd/bid	10	5-mg, 10-mg, or 15-mg Spansules; can be sprinkled into soft food (Do not cut, crush, or chew.)
Mixed amphetamine salts IR	Addderall Mixed amphetamine salts	2.5-5 mg	0.1-0.7 mg/kg/dose PO qd/qid; not to exceed 40 mg/d	0.3-0.5 mg/kg/dose PO tid/qid	4	5-mg, 7.5-mg, 10-mg, 12.5-mg, 15-mg, 20-mg, or 30-mg scored tabs
Mixed amphetamine salt XR	AdderallXR	5-10 mg	0.2-1.4 mg/kg/dose PO qd/tid Not to exceed 30 mg/d	0.6-1 mg/kg/dose PO qd/bid	10	5-mg, 10-mg, 15-mg, 20-mg, 25-mg, or 30-mg Spansules; can be sprinkled into soft food (Do not cut, crush, or chew.)
Lisdexamfetamine	Vyvanse	30 mg PO qam	30-70 mg PO qam	30-70 mg per day	13	20-mg, 30-mg, 40-mg, 50-mg, 60-mg, or 70-mg caps (Swallow cap whole, sprinkle into soft food, or dissolve contents in glass of water and drink immediately).to be used in patients with high risk of non-po abuse.

Medication	Brand Name	Initial Pediatric Dose	Pediatric Dosage Range and Maximum Dose*	Common Pediatric Dose*	Usual duration of effect	Preparations
Guanfacine	Tenex	0.5 mg qhs	Increase by .5 mg qd up to 3 mg qd Wean off over 2-4 days to avoid rebound HTN	1.5-3 mg per day	8-12 hours	1, 2, 3, 4mg tab Can be broken in half and cut into ¼
Guanfacine ER	Intuniv	1 mg PO qd initially; may adjust dose by increasing increments not exceeding 1 mg/wk	Dosing on mg/kg basis: 0.05-0.08 mg/kg PO qd initially, may adjust dose up to 0.12 mg/kg qd; not to exceed 4 mg/d Discontinuing drug: Taper in decrements not exceeding 1 mg q3-7 days Switching from immediate-release: Discontinue immediate-release tab and titrate with extended-release as described above Do not administer with high-fat meals (increases serum levels)	1-4 mg/d	T ½= 18 hours	1, 2, 3, 4mg tab Do not chew, crush, or split tablets before swallowing
Clonidine	catapres	.05 mg q hs	Increase by 0.05 mg qd up to 0.3 mg qd Wean off over 2-4 days to avoid rebound HTN	.15-.3 mg per day	6 hours	0.1,0.2,0.3, 0.4 mg tab Transdermal patch 0.1, 0.2, 0.3 mg weekly patches
Clonidine ER	Kapvay	0.1 mg PO qhs initially;	Increase dose 0.1 mg/day at weekly intervals Doses 0.2 mg/day or greater should be divided bid	0.1-0.4 mg po qd divided BID	T ½= 12-16 hours	**Dosage forms:** 1,2,3,4 ER Swallow tablet whole; do not crush, chew, or split
Atomoxetine	Strattera	<70 kg: 0.5 mg/kg PO qd initially afternoon); ≥ 70 kg: 40 mg PO qd initiall	not to exceed 1.4 mg/kg/d or 100 mg/d (whichever is less). Increase to 1.2 mg/kg after 3 days of starting dose.	1.2 mg/kg/day		10, 18, 25, 40, 60, 80, 100mg cap

* Maximum pediatric dose suggested by the US Food and Drug Administration (FDA). Although some children benefit greatly from doses greater than these, benefit from use of either the lowest and highest ends of the dose range is uncommon.

†The methylphenidate patch contains a different total methylphenidate dose than the name implies because it is designed to last 12 hours (eg, 10-mg patch [patch size 12.5 cm2] delivers about 10 mg over 9 h [estimated delivery rate is 1.1 mg/h for this particular patch]). Delivery rate varies depending on patch size.

‡Many patients describe their experience with methylphenidate SR preparations as erratic and uncomfortable

**For methylphenidate LA, CD, or ER preparations, convert by using a ratio of 2:1 with immediate-release methylphenidate. For example, Ritalin 10 mg q4h is converted to Ritalin LA 20 mg q8h. For a few patients, effects last only 5-6 hours with the LA preparations, although effects last 3.5-4 hours with the IR form. However, a short effect from one 8-hour preparation does not always mean another 8-hour preparation has the same problem.

Physician Resources

Nichq.org

Parent Resources:

Parentsmedguide.org

Chadd.org

References:

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Handouts from NICHQ website: nichq.org in collaboration with AAP and McNeil.